NOTES ON THE BURROW SYSTEM OF A COLONY OF *RATTUS NORVEGICUS* (BERKENHOUT,1767) NEAR CHRISTCHURCH

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ABSTRACT

The burrow system of a small colony of *Rattus norvegicus* on the western bank of the Avon river mouth, Christchurch, was excavated, mapped and described in May 1972. Fifteen rats (3 adult and 4 juvenile females; 7 juvenile males; 1 unsexed individual) were caught between 21 and 27 April in break-back traps set near the colony from 21 April to 5 May.

The burrows penetrated an inter-tidal *Salicornia* bed, the river bank and a grassy area, and were between 0.1 and 0.3 m below the surface. There were two systems, one with three, and the other with seven openings; the larger system (10.3 m of burrows) contained eight chambers, two with nests and two with dried grass only. No rat faeces or food stores were found in the burrows.

INTRODUCTION

Rattus norvegicus has been present in Christchurch since the middle of the 19th Century, the first specific reference to this species being in 1856 (Tancred 1856), when it was said to be exterminating the native rat, *Rattus exulans*. Charles Darwin found *R. norvegicus* at the Bay of Islands in 1835 (Watson 1956) and it is widely reported as having being accidentally introduced to New Zealand on whaling and sealing vessels about the beginning of the 19th Century. It is now distributed throughout New Zealand, primarily in towns, around farm buildings and along stream banks (Watson 1959).

In recent years, interest in rodent burrows has arisen following the survival by rats of atomic bomb blasts at the Nevada test site (Anderson and Allred 1964) and Eniwetok atoll (Jackson 1969). There are few descriptions of colony structure and general layout of *R. norvegicus* burrow systems with the notable exception of a paper by Pisano and Storer (1948) on poultry yard burrows in California. This contrasts with the literature on the burrowing of less economically important rodent species, e.g., *Onychomys leucogaster* (Ruffer 1965) and several field rats (Srivastava et al. 1967).

Ecological research published on *R. norvegicus* in New Zealand is restricted to that of Beveridge and Daniel (1965). The present study was carried out during the collection of rodents from the Christchurch municipal rubbish dump for parasitological data.

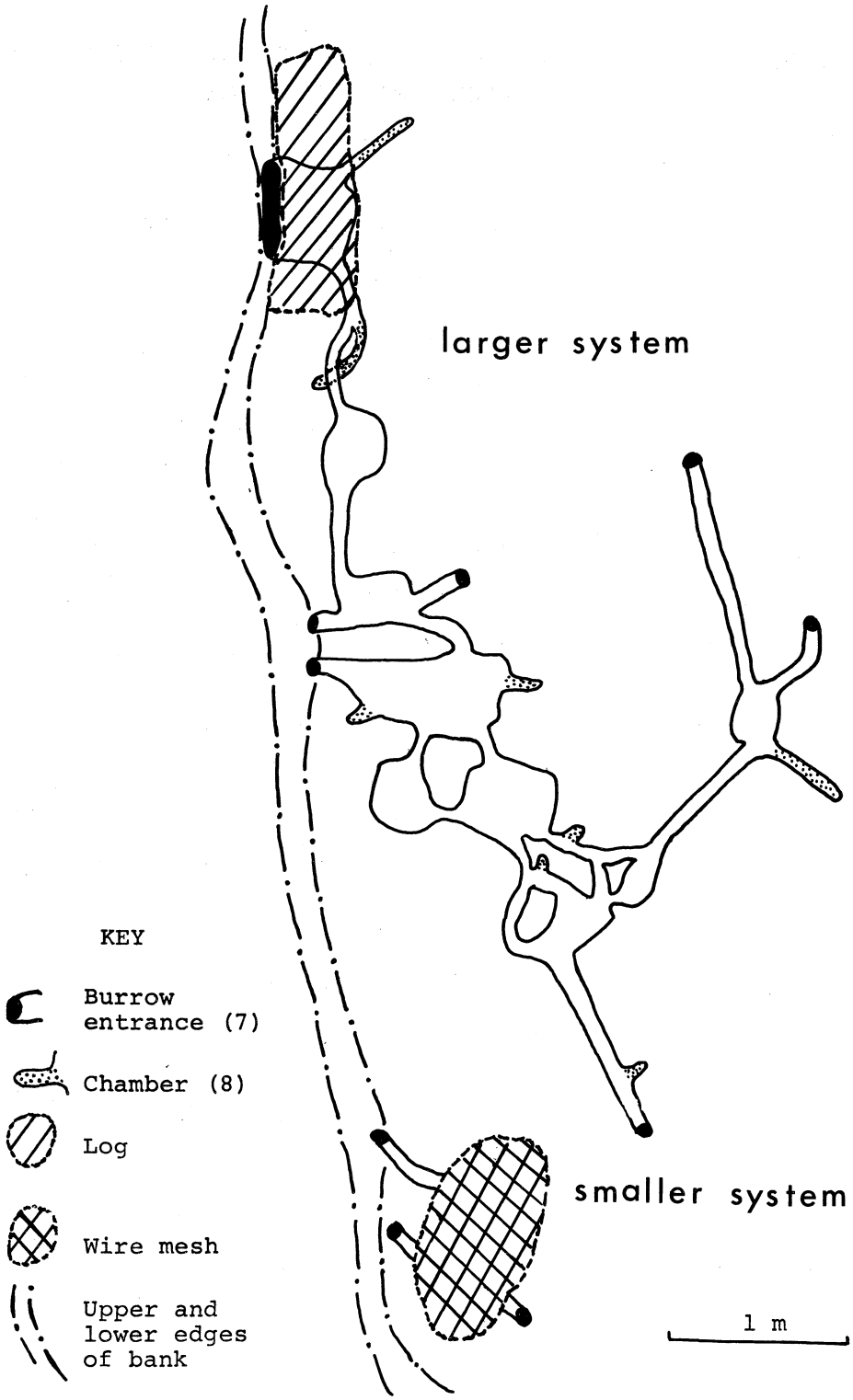

Fig. 1. Plan of burrow system of Rattus norvegicus near the bank of the Avon River mouth, Christchurch.

METHODS

The colony was trapped between 21 and 27 April 1971 with break-back traps which were placed outside burrows and across runways. The traps remained set until 5 May but no further rats were caught. Trapped animals were removed for examination of parasites. Body measurements and sex determinations were made except where carcasses had been partially eaten. On 13 and 14 May the burrow system was excavated and mapped.

RESULTS

The burrows were located near the western bank of the Avon river mouth (N.Z.M.S. 1, S84 : 082 562) on the edge of the Avon-Heathcote estuary. Openings led onto a level grassed area south of the former pine plantation near the river mouth, and into a 0.3-0.6 m high bank at the high tide level. These openings were connected by well marked runways, often in the form of tunnels, through the grass and the intertidal *Salicornia*. In the latter area rat paw marks were seen beyond the runways on the intertidal mud.

Fifteen rats trapped consisted of three adult females, seven juvenile males, four juvenile females and one partially eaten juvenile (Table 1).

TABLE 1. RATS COLLECTED NEAR AVON RIVER MOUTH, APRIL 1971

Head plus body length (mm)	Weight (g)	Age class	Sex	Date caught
228	364	Adult	F	22
232	318	"	F	21
188	210	"	F	26
117	54	Juvenile	F	26
103	39	"	F	26
84	≒40	"	M	22
100	32	"	F	27
80	27	"	M	23
92	24	"	M	23
93	23	"	F	23
≒93	≒23	"	?	23
91	22	"	M	26
94	21	"	M	23
87	21	"	M	23
94	≒21	"	M	23

In addition the remains of a skeleton and fur from a further adult rat were found 2 m from the burrows on the *Salicornia* bed. Although the skull was undamaged the incomplete

skeleton made determination of the cause of death, sex or body measurements impossible. Two of the adult females had enlarged teats and distended uteri.

The burrows formed two separate systems (Fig. 1). The smaller system could not be excavated as it descended beneath buried wire meshing probably from a collapsed fence. An extensive search failed to show more than three openings in this system. That part of the eastern system which was excavated gave the appearance of being only a tunnel system. The area beneath the mesh was probably only large enough to accomodate one chamber. In the larger system the burrows varied between 0.1 and 0.3 m below the surface, and at their greatest depth were less than 0.2 m above high tide level. In many burrows the ceiling coincided with the lower limit of the grass roots and removal of the tufts of grass was sufficient to expose the burrows. In all, the burrows extended over 10.3 m and had eight discrete chambers and seven openings.

The burrow system contained nests in two of the chambers and dried grass was found in two others. The nesting chambers consisted of widened portions of a burrow excavated to a greater depth. The nests were roughly circular and consisted of compact discs of dried grass and torn plastic bag. Animal bones and other debris were found in three of the chambers. No part of the burrow system contained rat faeces and no part appeared to be used for food storage. A wide variety of arthropods was found in the nests but the only parasite present was the common rat flea, *Nosopsyllus fasciatus*. This species was also collected from two of the hosts.

DISCUSSION

The rats collected cannot be assumed to constitute a discrete colony as small scale mass movements have often been reported when their environment is disturbed (Southern 1964) as trapping may have done. The sequence of capture suggests a relationship between the juvenile and adult rats, however. During the first two days, two adult rats, both with enlarged teats and distended uteri, and one juvenile (40 g) were caught. On the third day seven juveniles (21-27 g) were caught. On 26 April a further adult and three juveniles (22, 39 and 54 g) were caught and the final juvenile (32 g) was caught on the following day.

The 39, 40 and 54 g rats probably represent free-ranging juveniles while the smaller rats were nestlings. The removal of the two lactating, or recently lactating adult females, on the 21 and 22 April resulted in the nestlings moving beyond their burrows and subsequently being captured. The third adult female caught showed no evidence of recent pregnancy and it is likely that the nine juveniles between 21 and 32 g represent the litters of the first two adult females caught.

Beveridge and Daniel (1965) reported 19 entry holes in about 20 m of a 1.3 m high bank on Mokoia Island (Lake Rotorua). In the present study 11 holes were found in about one third of this distance and more occurred 15-16 m further along the estuary shore. As on Mokoia Island the runways were clearly evident. Those on the grassed area extended in the direction

of a rubbish dump but could only be distinguished for about the first 15 m. The many paw marks on the intertidal mud suggest that considerable activity, presumably feeding, also occurred there.

This system is somewhat larger than those discussed by Pisano and Storer (1948) where 31 of 34 burrows were less than 1 m in total length and the largest only 2 m. They designated those dens not containing nests as "shucking" stations where rats consumed their food in greater security than in the open. The variety of debris and bones found in three of the chambers in this study suggests that these were used for this purpose. The dried grass covering the floors of two chambers may have provided "bedding" for post-nestling juveniles and non-breeding adults. No above-gound "shucking" stations, plugs of loose soil and grass in openings serving as emergency exits, or bolt holes, noted by Pisano and Storer (1948), were seen.

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